CLAIMS

1. An isolated nucleic acid sequence containing at least one unmethylated CpG dinucleotide and having a formula:

$$5' N_1X_1CGX_2N_23'$$

wherein at least one nucleotide separates consecutive CpGs; X_1 is adenine, guanine, or thymine; X_2 is cytosine or thymine; N is any nucleotide and $N_1 + N_2$ is from about 0-26 bases with the proviso that $N_1 + N_2$ does not contain a CCGG quadmer or more than one CCG or CGG trimer; and the nucleic acid sequence is from about 8-30 bases in length.

2. The nucleic acid sequence of claim 1, wherein X_1 is thymine

3. The nucleic acid sequence of claim 1, wherein X_2 is thymine.

4. The nucleic acid sequence of claim 1, which is GTCG (T/C) T or TGACGTT.

5. The nucleic acid sequence of claim 1, wherein the sequence is TGTCG (T/C) T.

6. The nucleic acid sequence of claim 1, which is TCCATGTCGTTCCTGTCGTT.

7. The nucleic acid sequence of claim 1, which is TCCTGACGTTCCTGACGTT.

8. The nucleic acid sequence of claim 1, which is TCGTCGTTTTGTCGTTTTGTCGTT.

9. An isolated nucleic acid sequence containing at least one unmethylated CpG dinucleotide and having the formula:

$$5'NX_1X_2CGX_3X_4N\ 3'$$

wherein at least one nucleotide separates consecutive CpGs; X_1X_2 is selected from the group consisting of GpT, GpG, GpA, ApT and ApA; X_3X_4 is selected from the group consisting of TpT or CpT; N is any nucleotide and N_1N_2 is from about 0-26 bases with the proviso that N_1 and N_2 does not contain a CCGG quadmer or more than one CCG or CGG trimer; and the nucleic acid sequence is from about 8-30 bases in length.

10. The nucleic acid sequence of claim 9, wherein the nucleotide that separates at least two consecutive CpGs is thymine.

11. The nucleic acid sequence of claim 9, wherein X_3 and X_4 are thymine.

12. A nucleic acid sequence of any of claims 1 or 9, wherein at least one nucleotide has a phosphate backbone modification.

13. The nucleic acid sequence of claim 12, wherein the phosphate backbone modification is a phosphorothioate or phosphorodithioate modification.

14. The nucleic acid sequence of claim 13, wherein the phosphate backbone modification occurs at the 5′ end of the nucleic acid.

15. The nucleic acid sequence of claim 14, wherein the modification occurs at the first two internucleotide linkages of the 5′ end of the nucleic acid.

16. The nucleic acid sequence of claim 13, wherein the phosphate backbone modification occurs at the 3′ end of the nucleic acid.

17. The nucleic acid sequence of claim 16, wherein the modification occurs at the last five internucleotide linkages of the 3′ end of the nucleic acid.

18. A method of stimulating immune activation in a subject, wherein the stimulation is predominantly a Th1 pattern of immune activation, comprising administering to the subject a nucleic acid sequence having the formula of claim 1 or claim 9.

19. The method of claim 18, wherein the subject is human.

20. A method of stimulating cytokine production in a subject comprising administering to the subject a nucleic acid sequence having the formula of claim 1 or claim 9.

21. The method of claim 20, wherein the cytokine is selected from the group consisting of:

IL-6, IL-12, IFN-γ, TNF-α and GM-CSF.

22. The method of claim 20, wherein the subject is human.

23. The method of claim 20, where the nucleic acid sequence is selected from the group consisting of:
TCCATGTCGCTCCTGATGCT,
TCCATAACGTTCCTGATGCT,
TCCATGACGATCCTGATGCT,
TCCATGGCGGTCCTGATGCT,
TCCATGTCGGTCCTGATGCT,
TCCATAACGTCCCTGATGCT,
TCCATGTCGTTCCTGATGCT; and
TCGTCGTTTTGTCGTTTTGTCGTT.

24. A method of stimulating NK lytic activity in a subject comprising administering to the subject a nucleic acid sequence having the formula of claim 1 or claim 9.

25. The method of claim 24, where the subject is human.

26. The method of claim 24, where the nucleic acid sequence is selected from the group

consisting of:
TCGTCGTTGTCGTTGTCGTT,
TCCATGACGGTCCTGATGCT,
TCCATGACGATCCTGATGCT,
TCCATGACGCTCCTGATGCT,
TCCATGACGTTCCTGATGCT,
TCCATAACGTTCCTGATGCT,
TCCATCACGTGCCTGATGCT,
GGGGTCAACGTTGAGGGGGG,
TCGTCGTTTTGTCGTTTTGTCGTT,
TCGTCGTTGTCGTTTTGTCGTT,
GCGTGCGTTGTCGTTGTCGTT,
TGTCGTTTGTCGTTTGTCGTT,
TGTCGTTGTCGTTGTCGTT; and
TCGTCGTCGTCGTT.

27. A method of stimulating B cell proliferation in a subject, comprising administering to the subject a nucleic acid sequence having the formula of claim 1 or claim 9.

28. The method of claim 27, where the subject is human.

29. The method of claim 27, where the nucleic acid sequence is selected from the group consisting of:
TCCTGTCGTTCCTTGTCGTT),
TCCTGTCGTTTTTTGTCGTT,
TCGTCGCTGTCTGCCCTTCTT,
TCGTCGCTGTTGTCGTTTCTT,
TCGTCGTTTTGTCGTTTTGTCGTT,
TCGTCGTTGTCGTTTTGTCGTT; and
TGTCGTTGTCGTTGTCGTT.

30. A method of stimulating immune activation in a subject comprising administering to a subject an nucleic acid sequence having the formula of claim 1, wherein the nucleic acid sequence acts as an adjuvant.

31. The method of claim 30, where the subject is a mammal.

32. The method of claim 30, where the nucleic acid sequence is selected from the group consisting of:
TCCATGACGTTCCTGACGTT,
GTCG (T/C) T; and
TGTCG (T/C) T.

33. A method for treating a subject having an asthmatic disorder by administering to the subject an nucleic acid sequence in a pharmaceutically acceptable carrier having the formula of claim 1.

34. The method of claim 33, where the subject is human.

35. The method of claim 33, where the nucleic acid sequence is TCCATGACGTTCCTGACGTT.

36. A method for treating a subject having an autoimmune or other CpG associated disorder by inhibiting CpG-mediated leukocyte activation comprising administering to the subject an inhibitor of endosomal acidification in a pharmaceutically acceptable carrier.

37. The method of claim 36, where the subject is human.

38. The method of claim 36, where the inhibitor is selected from the group consisting of: bafilomycin A, chloroquine, and monensin.

39. The method of claim 38, where the inhibitor is administered at a dosage of the less than about 10 μM.

40. The method of claim 36, wherein the disorder is selected from the group consisting of systemic lupus erythematosus, sepsis, inflammatory bowel disease, psoriasis, gingivitis, arthritis, Crohn's disease, Grave's disease and asthma.

41. The method of claim 40, where the disorder is systemic lupus erythematosus.

add Q'

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